Table 5a

Maximum Permissible Exposure (MPE) for Small-Source Ocular Exposure to a Laser Beam †

Wavelength (μm)	Exposure Duration, t (s)	MPE ($J \cdot cm^{-2}$)	MPE ($W \cdot cm^{-2}$)	Notes
Ultraviolet				
0.180 to 0.302	10^{-9} to 3×10^{4}	3×10^{-3}		or 0.56 $t^{0.25}$ whichever is lower. (See Tables 8 and 9 for limiting apertures)
0.303	10^{-9} to 3×10^{4}	4×10^{-3}		
0.304	10^{-9} to 3×10^{4}	6×10^{-3}		
0.305	10^{-9} to 3×10^{4}	10×10^{-3}		
0.306	10^{-9} to 3×10^{4}	16×10^{-3}		
0.307	10^{-9} to 3×10^{4}	25×10^{-3}		
0.308	10^{-9} to 3×10^{4}	40×10^{-3}		
0.309	10^{-9} to 3×10^{4}	63×10^{-3}		
0.310	10^{-9} to 3×10^{4}	0.1		
0.311	10^{-9} to 3×10^{4}	0.16		
0.312	10^{-9} to 3×10^{4}	0.25		
0.313	10^{-9} to 3×10^{4}	0.40		
0.314	10^{-9} to 3×10^{4}	0.63		
0.315 to 0.400	10^{-9} to 10	0.56 $t^{0.25}$		
0.315 to 0.400	10 to 3×10^{4}	1.0		
Visible and Near Infrared				
0.400 to 0.700	10^{-13} to 10^{-11}	1.5×10^{-8}		(See Tables 8 and 9 for limiting apertures) For multiple pulses apply correction factor C_p given in Table 6.
0.400 to 0.700	10^{-11} to 10^{-9}	2.7 $t^{0.75}$		
0.400 to 0.700	10^{-9} to 18×10^{-6}	5.0×10^{-7}		
0.400 to 0.700	18×10^{-6} to 10	1.8 $t^{0.75} \times 10^{-3}$		
0.400 to 0.450	10 to 100	1×10^{-2}		
0.450 to 0.500	10 to T_1		1×10^{-3}	
0.450 to 0.500	T_1 to 100	$C_B \times 10^{-2}$		
0.400 to 0.500	100 to 3×10^{4}		$C_B \times 10^{-4}$	
0.500 to 0.700	10 to 3×10^{4}		1×10^{-3}	
0.700 to 1.050	10^{-13} to 10^{-11}	$1.5\ C_A \times 10^{-8}$		
0.700 to 1.050	10^{-11} to 10^{-9}	$2.7\ C_A\ t^{0.75}$		
0.700 to 1.050	10^{-9} to 18×10^{-6}	$5.0\ C_A \times 10^{-7}$		
0.700 to 1.050	18×10^{-6} to 10	$1.8\ C_A\ t^{0.75} \times 10^{-3}$		
0.700 to 1.050	10 to 3×10^{4}		$C_A \times 10^{-3}$	
1.050 to 1.400	10^{-13} to 10^{-11}	$1.5\ C_C \times 10^{-7}$		
1.050 to 1.400	10^{-11} to 10^{-9}	$27.0\ C_C\ t^{0.75}$		
1.050 to 1.400	10^{-9} to 50×10^{-6}	$5.0\ C_C \times 10^{-6}$		
1.050 to 1.400	50×10^{-6} to 10	$9.0\ C_C\ t^{0.75} \times 10^{-3}$		
1.050 to 1.400	10 to 3×10^{4}		$5.0\ C_C \times 10^{-3}$	
Far Infrared				
1.400 to 1.500	10^{-9} to 10^{-3}	0.1		For multiple pulses apply correction factor C_p given in Table 6 (See Tables 8 and 9 for limiting apertures)
1.400 to 1.500	10^{-3} to 10	0.56 $t^{0.25}$		
1.400 to 1.500	10 to 3×10^{4}		0.1	
1.500 to 1.800	10^{-9} to 10	1.0		
1.500 to 1.800	10 to 3×10^{4}		0.1	
1.800 to 2.600	10^{-9} to 10^{-3}	0.1		
1.800 to 2.600	10^{-3} to 10	0.56 $t^{0.25}$		
1.800 to 2.600	10 to 3×10^{4}		0.1	
2.600 to 10^{3}	10^{-9} to 10^{-7}	1×10^{-2}		
2.600 to 10^{3}	10^{-7} to 10	0.56 $t^{0.25}$		
2.600 to 10^{3}	10 to 3×10^{4}		0.1	

† See Table 6 and Figures 8 and 9 for correction factors C_B, C_C and time T_1. For exposure durations greater than 10 seconds and extended sources in the retinal hazard region (0.400 to 1.4 μm), see Table 5b.

Notes:
1. For repeated (pulsed) exposures, see Section 8.2.3.
2. The wavelength region λ_1 to λ_2 means $\lambda_1 \leq \lambda < \lambda_2$, e.g., 0.180 to 0.302 μm means $0.180 \leq \lambda < 0.302$ μm.
3. Dual Limit Application: In the Dual Limit Wavelength Region (0.400 to 0.600 μm), the listed MPE is the lower value of the photochemical and thermal MPEs as determined by T_1.

APPENDIX 1